Spring 5-21-2021

Preventing Central Line Associated Bloodstream Infections in an Adult Intensive Care Unit

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NURS 653: Internship

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May 4, 2021

Abstract

Central line associated blood stream infections (CLABSI) are considered preventable healthcare acquired infections, and are associated with significantly increased morbidity, mortality, and length of hospital stay. The CLABSI rate in an inpatient unit is a meaningful metric in relation to the safety and quality of care in that microsystem. This quality improvement project examines the efficacy of a CLABSI prevention bundle in reducing CLABSI events and improving adherence to central line care policy within a medical surgical adult intensive care unit. The target areas the bundle aimed to improve were unit processes, awareness of CLABSI and central line policies, and surveillance. The percentage of documented central line dressing changes by the weekly deadline was measured for a total of sixteen weeks, and the interventions were implemented over a total of seven weeks. The percent change in documentation rate from before and after the implementation period was a 32.9% increase and staff surveying before and after the implementation indicated an increase in staff knowledge of the hospital's policies surrounding central line care. This project demonstrates how a CLABSI prevention bundle can be used in a high-risk setting to decrease infection rates and improve quality of care, which has meaningful implications for other units looking to achieve similar results.

Keywords: Bloodstream infection, prevention, bundle, outcomes, central line, intervention

Preventing Central Line Associated Blood Stream Infections in an Adult Intensive Care Unit

Modern healthcare is built upon the ethical principle of beneficence, which means do good for those that the healthcare system serves. In the inpatient setting, preventing healthcare-acquired injuries and infections is integral to providing the highest quality of care. Central line-associated bloodstream infections (CLABSI) are one of the most common types of healthcare-acquired infections, and correlate with the negative healthcare outcomes of increased mortality rates, length of stay, and healthcare costs (Ziegler, 2014). The CLABSI rate is a defined measure of the number of CLABSIs per one thousand catheter days (CDC, 2021). This rate is recognized as a valuable metric of the safety and quality of care provided by national and global regulatory bodies such as The Joint Commission, Medicare, and the Agency for Healthcare Research and Quality (AHRQ) (AHRQ, 2017; The Joint Commission, 2012).

Of the ten healthcare acquired conditions tracked by the AHRQ, CLABSIs have the highest excess mortality rate and also carry the largest financial burden on the US healthcare system (AHRQ, 2017; Ziegler, 2014). The AHRQ estimates that the excess mortality rate associated with CLABSI is 0.150, meaning that per one thousand CLABSI cases, one hundred fifty excess deaths occur, after adjusting for underlying mortality (AHRQ, 2017). CLABSIs are also the most expensive of healthcare acquired conditions; the AHRQ estimates that the average cost of treatment related to a CLABSI is $48,108 (AHRQ, 2017). Motivation to reduce and prevent CLABSIs is not limited to optimizing patient outcomes; because healthcare organizations are not reimbursed by Medicare for healthcare costs associated with CLABSI, organizations also have a financial incentive to prevent CLABSI occurrence.

Patients in the intensive care unit (ICU) are at particularly high risk of developing CLABSIs, as these patients are more likely to have central lines and often have compromised immune systems (Marschall et al., 2014). A CLABSI is defined as the development of a laboratory-confirmed bloodstream infection in a patient with a central line in place during the forty-eight hour period before the onset of infection, that is not related to an infection at a different site of the body (CDC, 2021). Central lines may be peripherally inserted central catheters (PICCs) or central venous catheters (CVCs), both of which have statistically similar CLABSI rates (Chopra et al., 2013). Though significant progress has been made in reducing CLABSIs over the past decade, the AHRQ reports that, as of 2018, nearly 28,000 ICU patients die each year due to CLABSI (AHRQ, 2018b). CLABSIs are preventable, and there is a substantial body of evidence showing that adherence to evidence-based protocols for central line insertion and maintenance can significantly reduce or eliminate CLABSIs on a unit (Ista et al., 2016; Provonost et al., 2006). Studies on the efficacy of CLABSI bundle interventions have found that bundle-compliance must be 95% or higher in order to significantly reduce CLABSI rates (Furuya et al., 2011).

This paper reports on quality improvement initiative that focused on reducing CLABSI rates and improving adherence to evidence-based protocols for central line care in the ICU of a leading hospital in the San Francisco Bay Area. The 36-bed ICU is the main hub for critical care amongst affiliates of the hospital macrosystem in the western side of the Bay Area in Northern California. Though this is a Medical-Surgical ICU, the unit is highly specialized, supporting end organ failure, transplant, oncology, and stroke specialties as well as the organization's robust heart failure clinic (Unit Manager, personal communication, February 3, 2021). The majority of staff members on the unit are nurses with previous critical care experience. Staff nurses on the

floor typically care for one or two patients, and coordinate with respiratory therapists, nurse practitioners, medical residents, and medical doctors (Appendix F).

Problem Description

Central lines are often necessary for the administration of lifesaving treatments, as they are used for hemodialysis access, hemodynamic monitoring, parenteral nutrition, and vesicant medications. Central venous access also exposes patients to high rates of complications (McGee & Gould, 2003). One review estimated that fifteen percent of patients with central lines experience infectious, thrombotic, or mechanical complications (McGee & Gould, 2003). The infectious complications of central lines are called central line associated bloodstream infections (CLABSIs), which are associated with increased morbidity, mortality, length of stay, and healthcare costs (The Joint Commission, 2012). Patients in the ICU are at especially high risk of developing CLABSI, as these patients are more likely to have weakened immune systems and multiple catheters inserted more frequently than their non-ICU counterparts (Marschall et al., 2014). ICU patients are also at especially high-risk because their central line catheters are often placed in emergency situations, are frequently and repeatedly accessed, and remain in place for extensive amounts of time (Marschall et al., 2014). For these reasons, CLABSI prevention is of high importance in the critical care setting.

CLABSI rates are monitored internally by the organization as part of a quality and safety initiative that has been adopted by the hospital and its affiliates (Unit manager, personal communication, February 3, 2021). There was a marked increase in the number of CLABSIs in the hospital's ICU from four cases in 2019 to ten cases in 2020. These cases are harmful to the patient, increase acuity and workload for nurses on the unit, and are expensive for the hospital. Each of these cases is associated with negative outcomes for patients and at this hospital, the

range in additional costs associated with CLABSI is forty-five thousand to ninety-eight thousand dollars (Unit manager, personal communication, February 3, 2021). Because CLABSIs are considered preventable hospital acquired conditions, this financial burden falls on the hospital, and it is in the best interest of both patients and the hospital to prevent CLABSI from occurring.

There are three phases of central line use that present an opportunity for CLABSI to occur—insertion, maintenance, and removal (Resar et al., 2012). Infection onset after a central line had been in place for seven days or more in eight of the ten CLABSIs in the ICU in 2020. This implies that the infections most likely occurred due to poor adherence to evidence-based protocols in the maintenance phase of central line care, which is the phase targeted by this quality improvement project.

Current Scientific Evidence on CLABSI Prevention

A review of available literature was conducted using the keywords central line, infection, prevention, toolkit, and reduce. The aim of the review was to discover how a CLABSI prevention toolkit, compared to no CLABSI prevention toolkit, affects CLABSI rates in the ICU. The population being evaluated in this context is ICU patients. The review found that a variety of interventions have successfully reduced CLABSI rates in both developed and developing countries (Ista et al., 2016; Richter & McAlearney, 2018).

There are various guidelines for measures to prevent CLABSI in the insertion, maintenance, and removal phases of central-line care, but the key elements in these evidence-based guidelines are unified. In 2003, there was a statewide initiative for CLABSI prevention in Michigan and a keystone research study on the matter was published (Provonost et al., 2006). The study included one-hundred and three ICUs and piloted a “bundle” of best practices (Provonost et al., 2006). A bundle is a structured way of improving the process of care and

patient outcomes using a set of evidence-based interventions at the same time. Evidence-based interventions that are widely supported include using maximal sterile barriers and skin preparation with chlorhexidine gluconate during insertion, avoiding the use of the femoral vein for an insertion site, using proper hand hygiene techniques, conducting daily review of line necessity, and removing CLs as soon as they are no longer necessary (Provonost et al., 2006; Koo et al., 2021; Tang et al., 2014).

Numerous studies have shown that while bundled CLABSI interventions can successfully reduce CLABSI rates within a year, these improvements are difficult to sustain (Furuya et al., 2011; Miller & Maragakis, 2012). A cross-sectional study conducted in 2011 by the National Healthcare Safety Network (NHSN) found that having a written central-line care or CLABSI-prevention bundle was not associated with a significant decrease in CLABSI rates—a significant decrease was only observed when hospitals had a central line care policy, frequently assessed compliance, and reported policy compliance at ninety-five percent or higher (Furuya et al., 2011). This demonstrates that having a policy is not enough to achieve lasting change, and proposed that a unit must frequently assess compliance to the CLABSI-prevention bundle and achieve at least ninety five percent compliance in order to sustain lower CLABSI rates for multiple years (Furuya et al., 2011).

CLABSI bundles have been found to be most effective when they involve multiple disciplines (Resar et al., 2012). One study found bedside leadership line care rounds to be an effective CLABSI prevention measure (Owings et al., 2018). The rounds focused on improving patient safety, patient-centered care, staff and patient education, and provided opportunities for evaluating compliance with CLABSI prevention and identifying additional barriers and improvement opportunities (Owings et al., 2018). Russell et al. (2019) found that

interdisciplinary efforts dramatically reduced the CLABSI rate in an ICU from 4.3 to 1.8 CLABSIs per one thousand catheter days. The ICU served a patient population with high risk for CLABSI, and the study demonstrated the efficacy of multidisciplinary CLABSI prevention efforts in the setting of complex and high-risk patient populations (Russell et al., 2019).

Another crucial component of a successful intervention or bundle of interventions is creating a system that accurately monitors compliance with the CLABSI bundle and ensures frequent feedback to staff members (Dumyati et al., 2014; Ista et al., 2016; Richards et al., 2017). In this context, an intervention's success is defined by a decrease in CLABSI rates on the unit, an increase in monitoring for risk factors, and improved processes for central line insertion, maintenance, removal, and review of CLABSI events (Dumyati et al., 2014; Ista et al., 2016; Richards et al., 2017). Russell et al. (2019) found success with daily peer-peer monitoring on daily line management. Numerous other studies found that consistent auditing of compliance resulted in sustained decrease in CLABSI rates in both inpatient and outpatient settings (Dumyati et al., 2014; Ista et al., 2016; Richards et al., 2017).

Establishing a systematic approach to review CLABSI events and identify opportunities for preventing future CLABSIs is an important component of a consistently effective CLABSI bundle (Hallam et al., 2018; Tamuz & Harrison, 2006). This is one of the twelve Agency for Healthcare Research and Quality recommendations (AHRQ, 2018a). Ensuring that an interdisciplinary team conducts these reviews has been found to increase efficacy in the prevention of healthcare acquired conditions (AHRQ, 2018b).

Conceptual Framework and Application to Project

This process will align with Lewin's change theory, which has 3 phases: unfreezing, moving, and refreezing (Mitchell, 2013). In the unfreezing stage, the problem is identified and

the unit's capacity for change is assessed (Mitchell, 2013). In this project, an initial survey of fifty-nine staff nurses was performed to gather baseline data of knowledge pertaining to central line dressing changes, which revealed that 22% of nurses did not identify Wednesday as the central line dressing change day. To further assess capacity and readiness for change, a SWOT analysis was conducted (Appendix A). The SWOT analysis found that the unit lacked a standardized policy and process for central-line dressing changes and had poor compliance with documentation; however, strengths included that the staff members were engaged and generally responsive to quality improvement processes. It was concluded that the unit was amenable to the changes typically enacted with a CLABSI bundle. The unfreezing stage of this quality improvement project included the examination of the processes and patterns on the unit, research of relevant clinical studies and practice guidelines, and creation of the plan for improvement. Once a plan had been proposed, it was pitched to key stakeholders to discuss the importance of addressing the issue and request feedback on the proposed interventions. Key stakeholders included the nurse managers on the unit, the nursing supervisor, director of the Department of Nursing, and two professionals from the department of infection control.

Once buy-in was achieved, the moving stage of Lewin's change process was initiated. During the moving phase, the plan must be fleshed out and put into action (Mitchell, 2013). A timeline for this QI intervention was proposed over fifteen weeks, the process was detailed, and outcomes measures were defined, which can be referenced in Appendix B. The interventions were initiated, evaluated, and revised with a rapid cycling Plan, Do, Study, Act (PDSA) model (Appendix C). A more in-depth discussion of each of the interventions is provided in the methods section of this paper. The rate of central line dressing change documentation was tracked throughout the project and analyzed to determine if there was a significant change in

behavior on the unit. Back audits were performed on central line dressings that were not documented as changed to better understand if the gap was primarily in documentation or was in both changing dressings on time and in documentation of this change.

Refreezing is the final stage of Lewin's change theory, in which the new behavior is permanently integrated on the unit (Mitchell, 2013). This phase will be characterized by daily chlorhexidine gluconate (CHG) baths for patients on the unit, daily rounding on patients with central lines—which will be facilitated by the managers—regular use of peer-auditing forms (Appendix D) and use of the Intense Analysis Form (Appendix E) directly following the event of a CLABSI.

Specific Project Aim

This quality improvement process aimed to decrease CLABSI rates in the ICU of a major metropolitan hospital in the San Francisco Bay Area. The process began with assessing CLABSI rates, the current approaches for preventing CLABSI, and practices related to central line care on the unit. The process ended with evaluating the project's impact upon staff knowledge of CLABSI prevention measures, as well as how CLABSI rates on the units have changed following implementation. It was expected that the rates of central line dressing changes by the weekly deadline would increase, proper documentation of dressing changes would increase, CLABSI rates on the unit would decrease, and nursing knowledge about the weekly deadline for CL dressing changes would increase following the implementation of the project. Addressing CLABSI rates on the unit is an urgent matter because CLABSI is one of four major preventable complications that affects patients on this unit. Reducing CLABSI rates will improve patient outcomes and result in higher quality nursing care, and will reduce the financial burden associated with nosocomial infections on the unit.

Methods

Setting

The hospital's Department of Quality identified increased CLABSI incidence in the ICU in 2020. A multidisciplinary team was created to address CLABSI prevention in the hospital macrosystem, which is composed of the hospital and two affiliate campuses. The multidisciplinary team members include professionals from the quality department and the infection control department, ICU and VAT nursing managers, the director of nursing, medical doctors and master of science in nursing students. The entirety of this quality improvement project occurred in a span of fifteen weeks, which were divided based on the project phase—assessment, planning, implementation, evaluation, and monitoring. Appendix B details the actions in each of these phases and the corresponding timeline.

An initial assessment of the patients, professionals, processes, and patterns of the unit was conducted, using the Dartmouth Assessment for Inpatient Units (Appendix F). As the highest acuity ICU amongst the hospital affiliates in the Bay Area, the purpose of the unit is to provide safe, high-quality care to its patients. The processes and patterns related to CL care were mapped out in order to assess gaps between policy and practice (Appendix G). The CLABSI standard infection rate for the hospital and its two affiliate campuses for the year of 2020 was 0.848 (Unit manager, personal communication, February 3, 2021). The goal established by hospital leadership is a standard infection rate of 0.355, however the hospital ultimately aims to have zero CLABSI events and maintain this (Unit manager, personal communication, February 3, 2021).

Prior to this project's implementation, the hospital had two policies for central line care. Both of the policies stated that central line dressing changes must be completed on Wednesday

of each week, in addition to any situation in which the dressing is damaged or soiled. In practice, the central line dressing changes are typically completed by the nurse working night shift on Wednesday mornings around 0500. If this does not occur for any reason, it is the responsibility of the oncoming day shift nurse to change the dressing and document this. A report is generated every Thursday morning showing all the central lines on the unit and the documentation of each dressing being changed. Prior to this project, the average compliance with documented dressing changes on Wednesdays was 58.1% (Appendix P).

There was no routine process to assess line necessity prior to this project. The line necessity was determined by the provider ordering the line or the vascular access team, and the hospital had an "IV Decision Tree" which listed the indications for each type of line (Appendix H). This IV Decision Tree was not readily available to staff nurses on the unit.

Nursing staff members in the ICU that is the focus of this quality improvement project were surveyed regarding their knowledge of CL dressing care policies and the weekly deadline for CL dressing changes, as well as their knowledge of a decision tree showing the indications for a central line (Appendix H). Roughly three out of every four nurses who responded to the survey identified Wednesday as the weekly deadline for central line dressing changes. This was used in conjunction with the Dartmouth Assessment for Inpatient Units (Appendix F) to create a fishbone diagram (Appendix I) showing the factors related to environment, professionals, processes, and patterns that contribute to a CLABSI occurrence on the unit.

The multidisciplinary team used baseline data, information from the microsystem assessment and fishbone diagram, and the evidence-based practice recommendations gathered from the literature review to design a CLABSI-prevention bundle of interventions. If the bundle

is successful in reducing CLABSI rates and improving compliance to central line policy in the ICU, the project will be expanded to other units in the hospital.

Intervention

The areas of improvement targeted in the bundle were processes, awareness, and surveillance. For each of these target areas, there were multiple interventions (Appendix J). To improve CL processes on the unit, the CL policy was standardized, daily chlorhexidine gluconate baths for patients with central lines were initiated, and an intense analysis (IA) form was created. The purpose of the IA form was to provide a formally structured process for reviewing a CLABSI event, with the goal of identifying root causes and opportunities for improvement to prevent future events. This aligns with AHRQ recommendations for CLABSI prevention and is already an established process for catheter associated urinary tract infections on the unit (AHRQ, 2018a).

Interventions targeting awareness included an educational email on proper CL care and CLABSI prevention that was disseminated to all staff nurses, as well as a whiteboard with educational material on it (Appendix L). Other interventions to increase awareness of CLABSI and the correct documentation for CL dressing changes included signs posted in the supply room and "stand-up signs," which were disseminated each week on Tuesday nights and removed on Thursday mornings. The content of both of the signs included reminders about proper CL care, a video tutorial of CL dressing change, and instructions for correct documentation (Appendices M, N). The stand-up signs contained specific reminders about Wednesday being dressing change day.

Interventions addressing surveillance included peer-auditing forms, targeted CL dressing audits based on weekly reports of CL dressing documentation, daily rounding of line necessity

for all CLs that have been in place for seven days or more, and the creation of an Intense Analysis (IA) form to document retrospective data for any CLABSI event. Peer-auditing forms were distributed Wednesday evenings, and nurses were educated on how to fill out the forms and where to turn them in after co-signing with the Thursday morning nurse at handoff Thursday morning.

Monitoring and Evaluation

To collect data, weekly reports generated on Thursday mornings that listed all of the central lines on the unit were analyzed. The number of undocumented central line changes, or fallouts, were assessed to find the documentation rate on the unit each week. The lines placed on the Wednesday prior to the morning the report was generated were excluded from the fallout count. Hemodialysis lines were also excluded from the fallout count, as the dressing changes for these lines are done by the dialysis team on a schedule that is dependent upon the patient's dialysis schedule.

Peer-auditing forms were used as a data source to track the number of central lines in place without an indication falling under the facility's IV Decision Tree (Appendix H). The forms were also used to collect data on the number of central lines in place for seven days or more. This data was limited by the number of forms completed and submitted each week, and lack of compliance from the nurses was a barrier to accurate collection of this information on the unit.

A final survey was distributed to nursing staff after the intervention had been implemented for seven weeks to assess whether nurse knowledge about the unit's CL policy had changed. This survey inquired about when the central line dressing change deadline was each week and if there were any exceptions to not changing the dressing.

Measures

Measures collected during the study of this intervention were primarily quantitative, although feedback from each of the nurses on the unit was requested following the first PDSA cycle and changes were incorporated into the next cycle based on their input (Appendix C). Quantitative measures included the rate of CLABSIs on the unit and the standardized infection rate (SIR), as well as the rate of central line documentation, which was measured as the number of central line dressings documented as changed on Wednesday divided by the total number of central lines on the unit. Central lines placed on Wednesdays were excluded from the numerator value and percent change was calculated.

The number of central lines in without indication and the number of central lines in for seven days or more was tracked using the results from the peer-auditing forms submitted each week. This data was significantly limited by the number of peer-auditing forms that were completed and turned in by the nurses each Thursday, and therefor was excluded as an outcomes measure.

Ethical Considerations

Patients in the ICU who are able to make decisions for themselves preserve the right to autonomy, and thus have the option to refuse having their central line dressings changed. This poses an ethical dilemma, as timely CL dressing changes aligns with the ethical principles of beneficence and non-maleficence in healthcare but respecting the patient's wishes aligns with the principle of patient autonomy. The focus of this project is evidence-based change rather than a research study, and verification of these qualifications is shown in Appendix O. This project was reviewed by the University of San Francisco and was approved as an evidence-based change in practice project; therefore, IRB approval was not required.

Results

Quantitative measures collected during this project showed steady improvement in the rate of documentation of central line dressing changes by the weekly deadline. The average rates of CL dressing change documentation by the weekly deadline were 58.1% and 77.2% before and after the intervention, respectively, indicating a percent change of 33.2% (Appendix P). The graph displayed in Appendix P shows the upwards trend in documentation of CL dressing changes during the seven-week implementation phase. Prior to the beginning of March in 2021, dressing changes that were not completed because the lines were placed on Wednesday were counted as documentation fallouts, so the true documentation rates in the first two months of 2021 may have actually been slightly higher than reported. Despite this incongruence, the trend would still generally increase if these weeks were discounted.

No CLABSIs occurred on the unit during the implementation period of this project, and the SIR in this hospital and its two affiliate campuses decreased from 1.27 in January to 0.74 in March, both of which were below the predicted value (Nursing Director, 2021). The final survey of nurses indicated increased nursing knowledge and awareness of the CL dressing change expectations and policy on the unit. Ninety-three percent of staff nurses correctly identified Wednesday as the weekly deadline for dressing changes and answered correctly about exceptions for not changing a deadline by the deadline. Exceptions noted included having a dressing placed on Wednesday or the dressing being over a hemodialysis catheter.

Though the compliance to the peer-auditing forms was fragmented and therefor the data gathered from them is not representative of the entire unit, some insight was gained regarding barriers to dressing changes from the peer-auditing forms. One concern was that CL dressing changes often fell through the cracks if the patient was being transferred between units on

Wednesday, as some units in the hospital have the practice pattern of the Tuesday night shift performing CL dressing changes early in the morning on Wednesday before handoff to the day shift. This affects whether or not the dressing change gets completed on time because if the patient is transferred from the ICU on Wednesday afternoon, the ICU nurse may not have completed the dressing change yet but the receiving nurse may assume it was done by the Tuesday evening shift. This is a communication gap that will need to be addressed.

Another issue that the peer-auditing forms brought to the team's attention was that some patients refused having the CL dressings changed, which the nurse must respect in order to uphold patient autonomy. Another issue that was brought to the team's attention was the fact that dressing changes for hemodialysis catheters is the responsibility of the dialysis nurse rather than the primary nurse. Hemodialysis catheters are central lines and were included as fallouts in the central line count generated on the weekly report up until April 8, 2021. Because of this, the reported percentage of documented dressing changes by the weekly deadline prior to this date could be slightly lower than the true value.

Discussion

This quality improvement project has resulted in observable benefits over the seven week intervention period within this microsystem, including the standardization of the CL care policy and improved compliance to this policy. This was indicated by an increased proportion of CL dressing changes by the weekly deadline. This project increased awareness of the facility's weekly deadline for CL dressing changes, provided education on CLABSI prevention to nurses, and introduced the indications for each line type so that nurses have an opportunity to advocate for prompt de-escalation of the line as soon as a central line is no longer necessary.

A key factor in the project's success was the involvement of the ICU managers in the project, as they encouraged nurses to participate in all parts of the intervention and reinforced the importance of preventing CLABSI as a quality indicator of nursing care on the unit. Nursing knowledge of the policies surrounding central line care is crucial, but continued enforcement and monitoring by the managers is paramount to the project's sustainability following the piloting of this project. Managers also led the effort in implementing daily CHG baths and will be directly involved in daily rounding on patients with central lines. If a CLABSI does occur, the managers will utilize the IA form to review the event and target processes that need improvement on the unit.

No CLABSI events occurred on the unit over the course of this project and the SIR decreased from the beginning of the year, with a percent change of 41.7%. More time is needed to fully assess whether or not the efforts in this CLABSI bundle will have a lasting impact on CLABSI rates in the ICU. The interdisciplinary team leading the CLABSI prevention efforts in this hospital and its affiliate campuses have introduced and will continue to implement daily CHG baths for patients with central lines and daily rounding for all patients with central lines in this microsystem.

Conclusion

This quality improvement project was a useful component of the unit and the organization's journey to reaching the goal of zero CLABSI events. Though the concentration of central lines on a unit is generally highest in the ICU of this hospital, patients on other units do have central lines and CLABSIs have occurred there in the past. Because of the project's success in the ICU, the project will be modified and replicated in the transitional intensive care unit and five medical-surgical units in this hospital. The project may potentially be adopted by the ICU

and other units of the two affiliate campuses in the organization. The modifications that will need to occur will be dependent upon the unit and the level of involvement that managers are willing to provide.

In order to produce lasting and sustained change on the unit, continued compliance with timely CL dressing changes and proper documentation is a necessity. Furuya et al. (2011) found that a policy compliance of ninety-five percent or higher is imperative to sustaining change in the context of a CLABSI prevention bundle. This project will need to be modified in order to be sustained in the ICU because of the workload involved with distributing and collecting the peer-auditing forms and stand-up signs, as well as tracking data gathered from the forms. Depending on manager preference, the forms and stand-up signs may be distributed on one week each month or at a different frequency. Data regarding the percentage of documentation compliance will continue to be gathered every Thursday, and the data will either be directly sent to managers so that they can determine number of fallouts and follow up on this or the data for all units in the hospital will be calculated by a member of the CLABSI Prevention Committee and then reported to each manager. In the case of the former, a meeting with all the managers will need to take place in order to standardize the process of determining fallouts.

This project has illustrated how increasing awareness of an issue amongst the nursing staff, using peer-auditing forms, and providing education on the topic can improve compliance to hospital policy and ultimately lead to improved safety and patient outcomes at the microsystem level. Preventing patients from harm is a value that is fundamental to both nursing practice and to healthcare as a whole, and the expansion of this project throughout this hospital and its affiliate campuses represents an opportunity to provide safer care for patients in the acute care setting.

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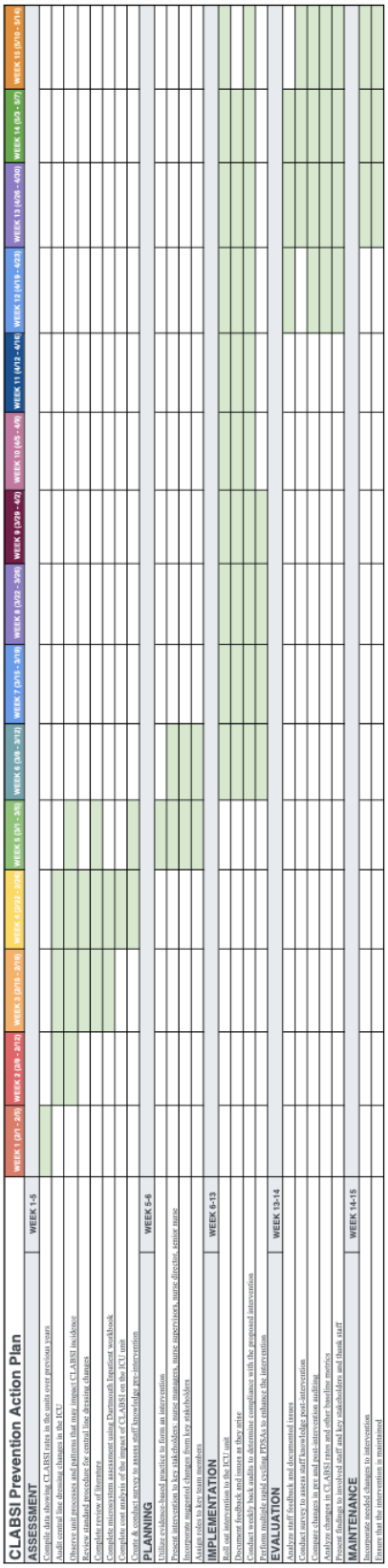
Appendix A
SWOT Analysis

SWOT Analysis	
Strengths (internal) - The intervention is generalizable to all staff in the unit despite level of experience or skill - High functioning unit - Adaptable to change - High quality of care - Staff are frequently involved in unit-based continuing education	**Weaknesses (internal)** - Large unit, both in staff and size. There are many nurses to educate. - Push back from doctors and nurses regarding D/C of central lines and using less invasive lines. - Central line dressing changes are not standardized - Documentation for central line dressing changes is inconsistent - High acuity of the unit presents many opportunities for nurses to get distracted from following correct dressing change and documentation - Vast range of nursing skills and levels of performance
Opportunities (external) - Improve knowledge and evidence-based practice of CLABSI prevention and central line care - Improve CLABSI prevention practices by referring to evidence based practice recommendations and the practices of other CPMC campuses with lower rates of CLABSI	**Threats (external)** - Burnout from COVID-19 decreases receptiveness to learning or change - COVID-19 places patients at higher risk of developing CLABSI

Appendix B
CLABSI Prevention Project Timeline



Appendix C
PDSA Cycles

PDSA CYCLE 1

PLAN: 2/25/2021 - 3/9/2021

What change is being tested? Implementing Central Line Assessment Checklists, which will be further referred to as peer-auditing forms, and can be referenced in Appendix D

Who will be involved? The AM and PM nurses that work upcoming the Wednesday deadline to change central line dressings are responsible for completing and turning in the checklists by 0800 Thursday.

Where will this change be tested? ICU

How long will it take to implement the change? The peer-auditing forms will be handed out at 1855 Wednesday and they will be turned in at 0800 Thursday, which is approximately 13 hours. This change will be implemented on a weekly basis.

What do we predict will happen and why? We predict that compliance in documenting central line dressing changes will increase, as well as compliance in following policies: date and initials on the dressing, caps on connectors not attached to lines, IVPB <24 hours, IV tubing <96 hour, and connectors are changed. Additionally, we hope that central lines that are not indicated or that have been in for longer than 7 days will be reevaluated by the provider and/or VAT.

1. **Plan intervention of peer-auditing forms**
    a. Share evidence-based practice (EBP) found in the literature search that may apply to this unit to decrease CLABSI wit
    b. key stakeholders
    c. Design peer-auditing forms that incorporate EBP recommendations, including:
        i. Verify completion of steps of central line dressing change and central line maintenance care, including documentation
        ii. Indicate duration of CL use
        iii. Identify indications for the CL with prompt to escalate if CL is not indicated *or* has been in for longer than 7 days
        iv. Signature of nurses regarding completion of checklist items
    d. Incorporate edits and suggestions from key stakeholders
    e. Plan with the interdisciplinary team regarding implementation of the intervention
    f. Print out the peer-auditing & central line care checklists

DO: 3/10/2021 - 3/11/2021

1. **Implement peer-auditing & central line care checklists in the ICU**
    a. Inform nurses
        i. During the 1855 Wednesday huddle**,** inform nurses, answer any questions, and describe expectations about the implementation of the checklist
    b. Document problems and unexpected observations
        i. Unexpected observations may include: lack of support, involvement, or enthusiasm of from nurses
        ii. Problems that may arise include: pushback, blame culture

STUDY: 3/11/2021 - 3/16/2021

1. **Perform back-auditing to confirm compliance with the intervention**
2. **Analyze changes in data and compare to predictions**
    a. Compare pre and post-intervention:
        i. Percentage of documented dressing changes in the ICU
        ii. Compliance with following other central line policies: date and initial of the dressing, connectors are changed, caps are on connectors not attached to lines, IVPB bags are <

24 hours, and IV tubing is < 96 hours
   b. Compare number of peer-auditing forms completed with the number of central lines in the unit
3. **Summarize what was learned**
   a. Communicate findings with the nurse managers
      i. Disparity between number of central lines on the unit and the number of auditing forms submitted on Thursday morning
      ii. Some action items marked as complete on forms were not complete in practice.
         1. Documentation of the central line dressing change
         2. Date & initials on the dressing
4. **Analyze problems and unexpected observations**
   a. Communicate barriers and issues with key stakeholders
   b. Devise potential solutions to these problems with key stakeholders

ACT: 3/16/2021

1. **What changes are to be made?**
   a. Pass out several peer-auditing forms to nurses and instruct them to fill out one form for each central line.
   b. Pass out the peer-auditing forms at 1855 Wednesday huddle and educate nurses as needed
   c. Educate nurses at 0655 Thursday huddle regarding completion of the peer-audit form
2. **What will happen in the next cycle?**
   a. Incorporate potential solutions to address the challenges faced during the first PDSA cycle
   b. Roll out intervention again in the ICU
   c. Plan educational intervention

PDSA CYCLE 2

PLAN: 3/16/2021 - 3/29/2021

What change is being tested? Implementation of revised peer-auditing forms and posting signs on the unit. The educational signs will be disseminated centrally on the unit—one will be posted in the PYXIS near the central line dressing change kits (Appendix M), and the stand up signs will be distributed each week on the unit computer hubs on Tuesday evenings and removed on Thursday mornings (Appendix N).

Who will be involved? The AM and PM nurses that work upcoming the Wednesday deadline to change central line dressings are responsible for completing and turning in the checklists by 0800 Thursday. The Tuesday PM and Wednesday AM shifts will be exposed to the stand up signs, and all nurses working on the unit will be exposed to the sign in the PYXIS and the educational email.

Where will this change be tested? ICU

How long will it take to implement the change? The checklists will be handed out at 1855 Wednesday and they will be turned in at 0800 Thursday, which is approximately 13 hours. And this change will be implemented on a weekly basis. The posting of the educational intervention in the PYXIS will take less than one hour and will occur on 3/25/2021.

What do we predict will happen and why? We predict that compliance in documenting central line dressing changes will increase, as well as compliance in following policies: date and initials on the dressing, caps on connectors not attached to lines, IVPB <24 hours, IV tubing <96 hour, and connectors are changed. Additionally, we hope that central lines that are not indicated or that have been in for longer than 7 days will be reevaluated by the provider and/or VAT.

1. **Edit peer-auditing forms**
   a. Incorporate edits and suggestions from key stakeholders, incorporate clearer instructions and specifically state the deadline window for CL dressings to be changed. State that 1 checklist is to be completed per central line dressing. Update indications for CL/PICC referring to the update IV access tree.
   b. Communicate and plan with the interdisciplinary team regarding implementation of the

intervention
   c. Print out the peer-auditing & central line care checklists
2. **Design two-part educational intervention**
   a. (1) Create a laminated index card-sized sign to be posted in the PYXIS where the central line dressing kits are stored, components of the index card include:
      i. Create QR codes for tutorial video and screenshot of correct Epic charting for CL changes.
      ii. Reminder of deadline, date, initial, documentation, and specific CLABSI prevention measures.
   b. (2) Create laminated stand-up signs with reminders about the weekly dressing-change deadline and proper documentation
   c. Identify the location for the index card to be placed in the PYXIS near the central line dressing change kits
   d. Meet with stakeholders to review the educational intervention and incorporate their suggestions
      i. Include updated Epic screenshot of correct charting

DO: 3/23/2021 - 4/1/2021

1. **Implement updated peer-auditing & central line care checklists in the ICU**
   a. Inform nurses
      ii. Inform nurses, answer any questions, and describe expectations about the implementation of the checklist during the 1855 Wednesday huddle
      iii. Provide the opportunity for suggestions and feedback regarding the audit forms
         1. Recorded suggestions from bedside nurses and charge nurses
   b. Document problems and unexpected observations
      i. Unexpected observations: lack of support, involvement, or enthusiasm of from nurses
      ii. Problems that arose: pushback, blame culture, lack of compliance in completing the checklists
2. **Roll out three-part educational intervention on the unit**
   a. (1) Educational index card: post in PYXIS
   b. (2) Stand up signs: place out on unit on Tuesday evenings, collect Thursday mornings starting Tuesday 3/31/2021
   c. (3) Educational email: Send out to all staff nurses on the unit on 3/31/2021

STUDY: 3/24/2021 - 4/1/2021

1. **Perform back-auditing to confirm compliance with the checklist interventions**
2. **Analyze changes in data and compare to predictions**
   a. Compare pre and post-intervention:
      i. Percentage of documented dressing changes in the ICU
      ii. Compliance with following other central line policies: date and initial of the dressing, connectors are changed, caps are on connectors not attached to lines, IVPB bags are < 24 hours, and IV tubing is < 96 hours
   b. Compare number of completed forms submitted with number of central lines in the unit
3. **Summarize what was learned**
   a. Communicate findings with the nurse managers regarding peer-auditing forms:
      i. Less checklists were completed for every central line in the unit
      ii. Significantly more checklists were completed when handed out by nurse manager than graduate students
      iii. Forms were completed, but action items marked on the forms were not actually done
         1. Documentation of the central line dressing change
         2. Date & initials on the dressing
   b. Disparity between number of central lines on the unit and the number of auditing forms submitted on Thursday morning
4. **Analyze problems and unexpected observations**

a. Communicate barriers and issues with key stakeholders
b. Devise potential solutions to these problems with key stakeholders

ACT: 4/1/2021

1. **What changes are to be made?**
    a. Handing out the peer-auditing forms to nurses is to be done by a person holding a leadership position in the unit (nurse manager, nurse supervisor, or charge nurses). This will increase compliance in completing the checklists compared to if the checklists were handed out by graduate students.
        i. Coordinate with this person regarding passing out the checklists Wednesday evening.
2. **What will happen in the next cycle?**
    a. Incorporate changes into the next cycle.

Appendix D
Peer Auditing Form

Central Line Assessment Checklist: ICU

PLEASE COMPLETE 1 FORM FOR EACH CENTRAL LINE

**If your patient does not have any central lines, please fill in room # & date and turn in

Date: _____ Room #: _____ Central line type: _____ **Check that the following are completed Wednesday between 00:00 and 23:59** ☐ Change dressing ☐ Date and initial the new dressing ☐ Place caps on connectors not attached to lines ☐ Confirm that IVPB bags is <24 hours ☐ Confirm that IV tubing is <96 hours ☐ Chart CL care completed for *every* CL	Has this line been in for 7 days or more? ☐ Yes ☐ No **Mark which of the indications listed on the back of this form apply to your patient's CL.** *If CL does not fall under any of the CL/PICC indications on the back of this form, or has been in for >7 days, notify the vascular access team & HCP.* RN Wednesday PM Name: _____ RN Thursday AM Name: _____

PLEASE TURN IN THIS FORM INTO THE CONTAINER AT THE NURSE STATION AT 0800 THURSDAY

Please Mark Indications that Apply to Your Patient's Central Line

Central Line & PICC	Midline	Extended Dwell Catheter
☐ Vesicant or irritant ☐ TPN ☐ pH < 5 or pH > 9 ☐ IV ABX > 4 weeks ☐ needs multiple drugs infusing at the same time ☐ Needed for a device ☐ Dialysis ☐ SvO2 monitoring ☐ CVP monitoring	☐ IV access for < 30 days ☐ Inability to ID visual veins, vessel depth > 2.5 cm ☐ Non-vesicant ☐ PPN ☐ IV ABX < 4 weeks ☐ IV ABX pH 7 +/- ☐ Failed USGPIV/EDC	☐ IV access for < 28 days ☐ Multiple blood draws needed ☐ Unable to visually ID veins, vessel depth >1.5-2 cm ☐ Obese & Bariatric (deep vessels) ☐ Known difficulty IV access patients ☐ IV drug abuse ☐ Repeated failed PIVs (>3 in current admission) ☐ CKD stage III and above ☐ DKA ☐ Cancer without ports ☐ Chronic illness (multiple admissions, vessel fragility) ☐ Extreme ages (young/old)
☐ Other:_____		

PLEASE TURN IN THIS FORM INTO THE CONTAINER AT THE NURSE STATION AT 0800 THURSDAY

Appendix E
Intense Analysis Form for CLABSI

CLABSI Intense Analysis (IA) Form

Once each area has been informed by Infection Control of Unit CLABSI, this form is to be completed and sent to Infection Control and a copy kept on file with the unit manager.

Form completed by: _____ Date: _____

Patient Information				
Patient Name:	MRN:	Age:	☐ Female ☐ Male	
Admit Date:	Attending MD/Service:	Primary Diagnosis:	Date of CLABSI event:	Unit of CLABSI event:

Patient Risk Factors	
Please Indicate:	
☐ Male	☐ Multiple CVCs
☐ Burn/Trauma/Critical Care	☐ Parenteral Nutrition
☐ CVC > 7 days	☐ Multiple lumen CVCs
☐ CVC dressing changed > 7 days	☐ Immune deficiency
☐ CVC at femoral site	☐ Heavy microbial colonization at insertion site
☐ CVC at IJ site	☐ Hematological deficiency
☐ Lack of maximal sterile barriers for insertion	☐ GI disease
☐ CVC Insertion in ICU or ED	☐ Cardiovascular disease
☐ Prolonged hospitalization prior to CVC insertion	☐ COVID-19 Infection
Patient Co-morbidities:	

Insertion			
Date of insertion:	Insertion location (Unit):	# Attempts:	Name of inserting provider:
CVC line type:			

Indications:	
☐ Vesicant or irritant	☐ pH < 5 or pH > 9
☐ Parenteral Nutrition	☐ CVP monitoring

☐ Multiple drug infusions at the same time ☐ IV antibiotics for longer than 4 weeks	☐ SvO2 monitoring
Alternatives Considered: ☐ Midline ☐ Extended Dwell ☐ PIV ☐ USGPIV	
Maintenance	
Documentation of central line dressing changes every 7 days.	☐ Yes ☐No Comments:_____ _____
Documentation of daily central line site assessment.	☐ Yes ☐No Comments:_____ _____
Documentation of daily central line patency.	☐ Yes ☐No Comments:_____ _____
Documentation of daily central line indications.	☐ Yes ☐No Comments:_____ _____
For PICC: documentation of daily measurements of circumference of the mid-upper arm & length of exposed line.	☐ Yes ☐No Comments:_____ _____
Discontinue	
Date of discontinuation:	
1. MD order in Epic for discontinuation?	☐ Yes, Epic order present ☐ Yes, order documented in progress notes ☐ No order documented
2. Delay in removal of CVC after order placed?	☐ Yes, # hours delayed:____ ☐ No

List one or more actions that could have prevented this CLABSI:

Appendix F
Dartmouth Assessment for Inpatient Units, Microsystem Assessment for ICU

Inpatient Unit Profile

A. Purpose: Highest acuity ICU in Sutter Health system, large programs for HF patients and organ transplants.

B. Know Your Patients:

Est. Age Distribution of Pts:	**%**
19-50 years	10%
51-65 years	40%
66-75 years	30%
76+ years	20%
% Females	50%

List Your Top 10 Diagnoses/Conditions	
1. Heart Failure	6. Neuro
2. Liver Failure	7. ABD surgery
3. Organ Transplant	8. Renal Failure
4. Sepsis	9. Acute organ failure
5. GI Bleed	10. ETOH withdrawal

Patient Satisfaction Scores		% Always
Nurses		85 %
Doctors		90 %
Environment		70 %
Pain		95 %
Discharge (transfer to floors)	% Yes	100%
Overall	% Excellent	95 %

Living Situation	**%**
Married	40%
Domestic Partner	21%
Live Alone	10%
Live with Others	10%
Skilled Nursing Facility	5%
Nursing Home	5%
Homeless	10%

Patient Type	**LOS avg.**	**Range**
Medical	5 days	1-60 days
Surgical	2 days	1-4 days

Point of Entry	**%**
Admissions	8%
Clinic	2%
ED	60%
Transfer	30%
Discharge Disposition	**%**
Home	3%
Home with Visiting Nurse	0%
Skilled Nursing Facility	5%
Other Hospital	90%
Rehab Facility	5%

Pt Population Census: Do these numbers change by season? (Y/N)	**Y/N**
Pt Census by Hour	Y
Pt Census by Day	Y
Pt Census by Week	Y
Pt Census by Year	Y
30 Day Readmit Rate	N
Our patients in Other Units	N/A
Off Service Patients on Our Unit	N/A
Frequency of Inability to Admit Pt	N/A

C. Know Your Professionals:

Current Staff	**Day FTEs**	**Evening FTEs**	**Night FTEs**	**Weekend FTEs**
MD Total				
Hospitalists Total				
Unit Leader Total	2.0			
CNSs Total				
RNs Total	38.2	37.8	50.5	
LPNs Total				
LNAs Total	3.0	2.4	3.5	
Residents Total				
Technicians Total				
Secretaries Total	2.1	0.2	0	
Clinical Resource Coord.				
Social Worker				
Health Service Assts.				
Ancillary Staff				

Admitting Medical Service	**%**
Internal Medicine	20%
Hematology/Oncology	5%
Pulmonary	50%
Family Practice	5%
ICU	20%
Other	0%

Supporting Diagnostic Departments

Respiratory, Lab, Cardiology, Pulmonary, Radiology, Transplant, Oncology, Plastic Surgery

Do you use Per Diems?	13 % Yes		
Do you use Travelers?	Yes		
Do you use On-Call Staff?	Yes (periodically)		
Do you use a Float Pool?		NO	

Staff Satisfaction Scores		**%**
How stressful is the unit?	% Not Satisfied	20 %
Would you recommend it as a good place to work?	% Strongly Agree	85 %

D. Know Your Processes:

1. Create flow charts of routine processes.	**Do you use/initiate any of the following?**
a) See Appendix E	Check all that apply ☒ Bed Management Rounds ☒ Multidisciplinary/with Family Rounds

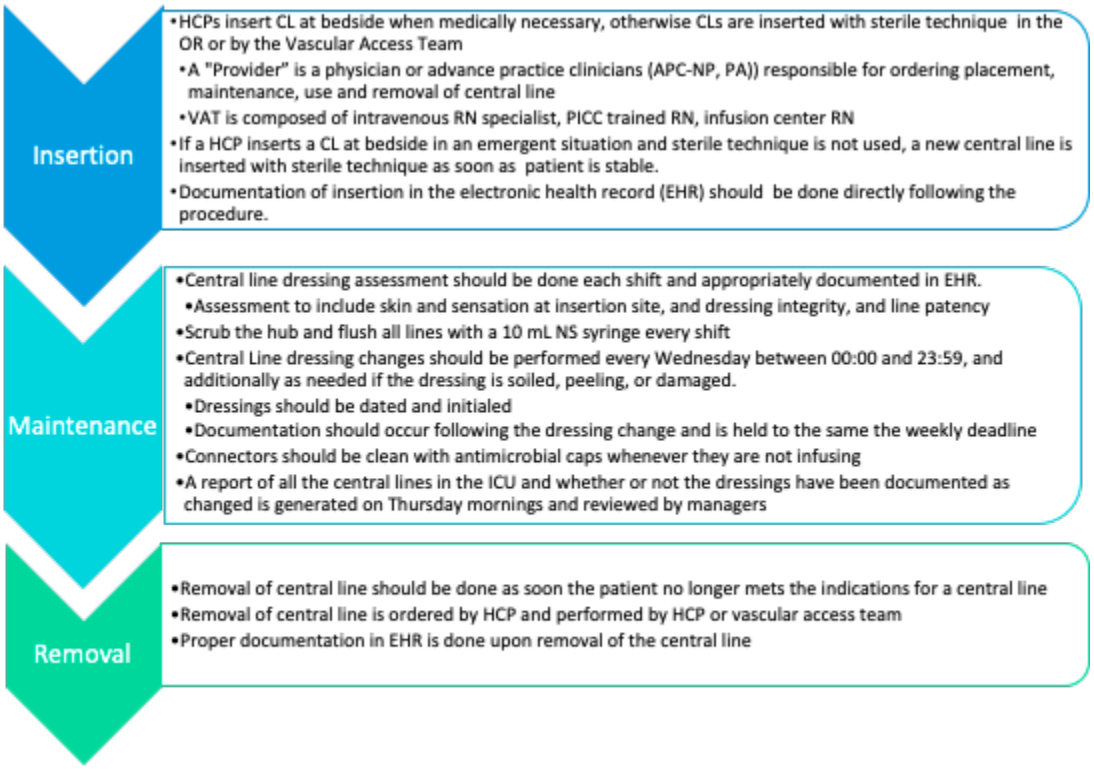
Capacity	36 rooms, 36 beds

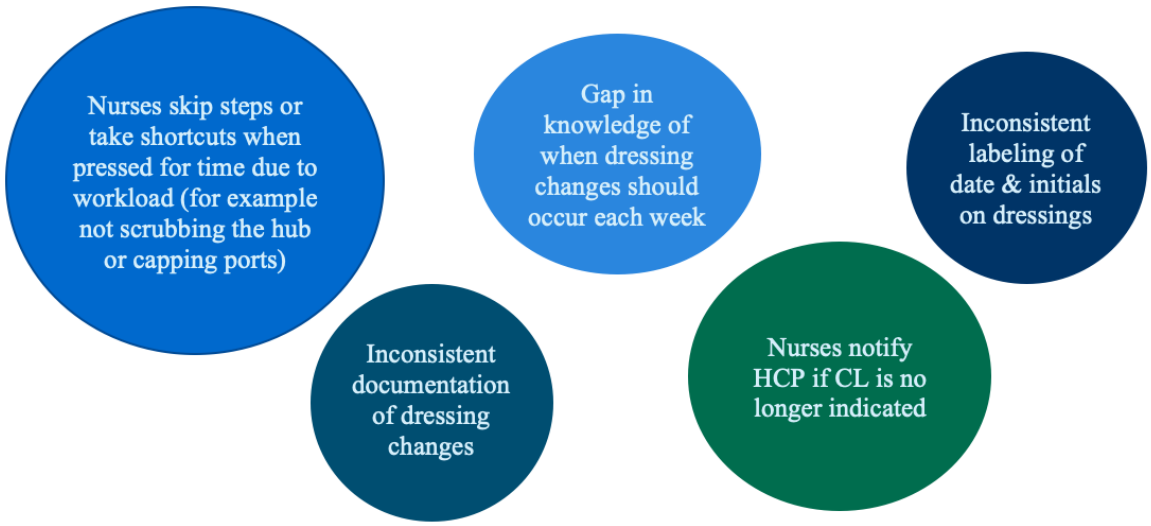
Linking Microsystems

ER, PACU, Cath Lab, Telemetry Units, Med/Surg units

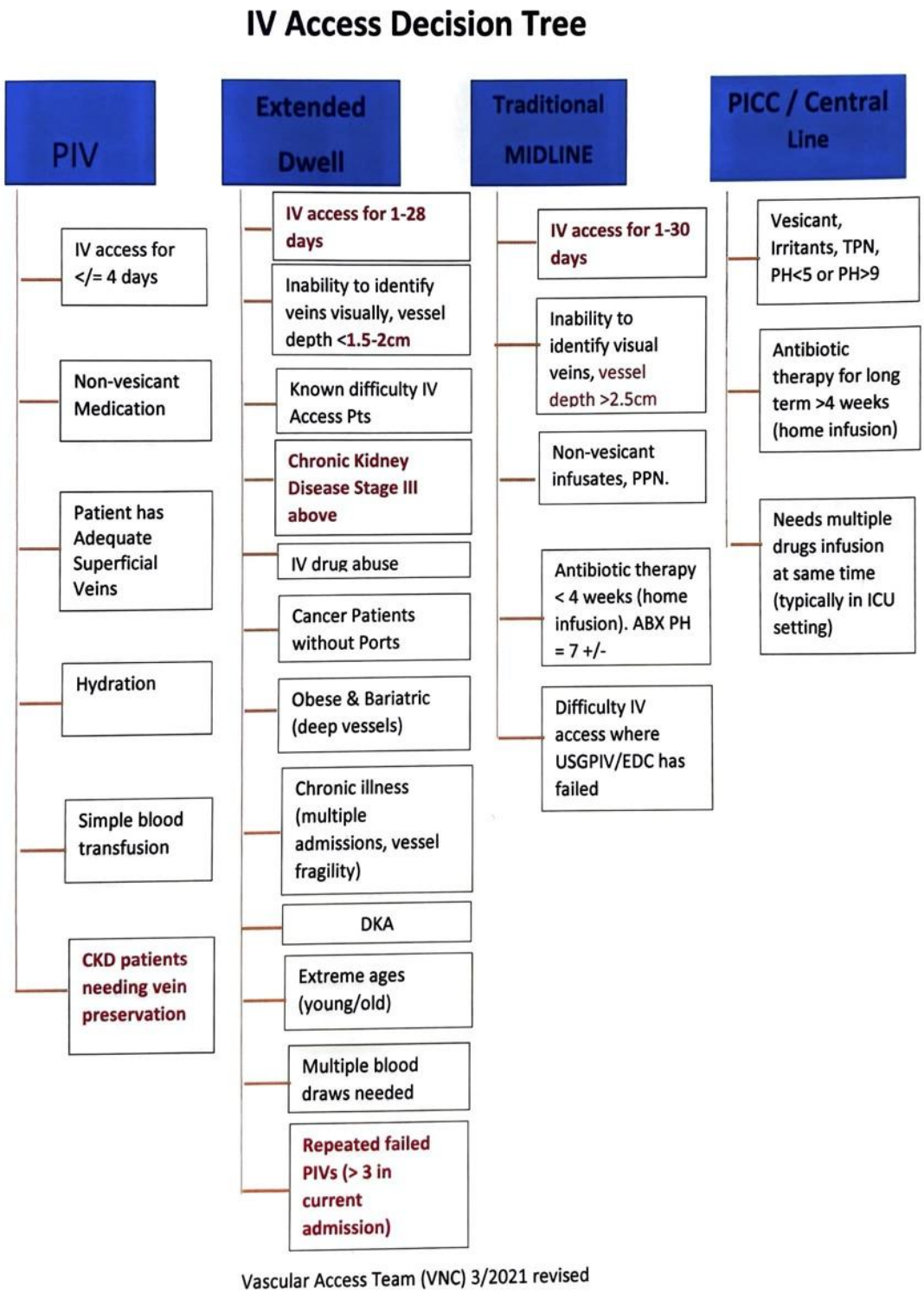
<table>
<tr><td></td><td>☒ Midnight Rounds
☒ Preceptor/Charge Role
☒ Discharge Goals</td><td></td></tr>
<tr><td colspan="3">E. Know Your Patterns:</td></tr>
<tr><td rowspan="2">• Does every member of the unit meet regularly as a team?
Yes at change of shifts during huddles</td><td rowspan="3">• Do the members of the unit regularly review and discuss safety and reliability issues?
UBC and RRT meetings held every month</td><td>• What have you successfully changed?
Increased nurse knowledge regarding CLABSI prevention and decreased CLABSI rate in the ICU</td></tr>
<tr><td>• What are you most proud of?
Preventing future patient harm and improving the knowledge and quality of care that ICU nurses give to their patients.</td></tr>
<tr><td>• How frequently?
Start of every shift at 0655 and 1855</td><td>• What is your financial picture?
Prevention of CLABSI -associated costs</td></tr>
<tr><td colspan="3">• What is the most significant pattern of variation?
Central line dressing changes: frequency, documentation, and following correct protocol and policy</td></tr>
</table>

Appendix G
ICU Central Line Processes & Patterns

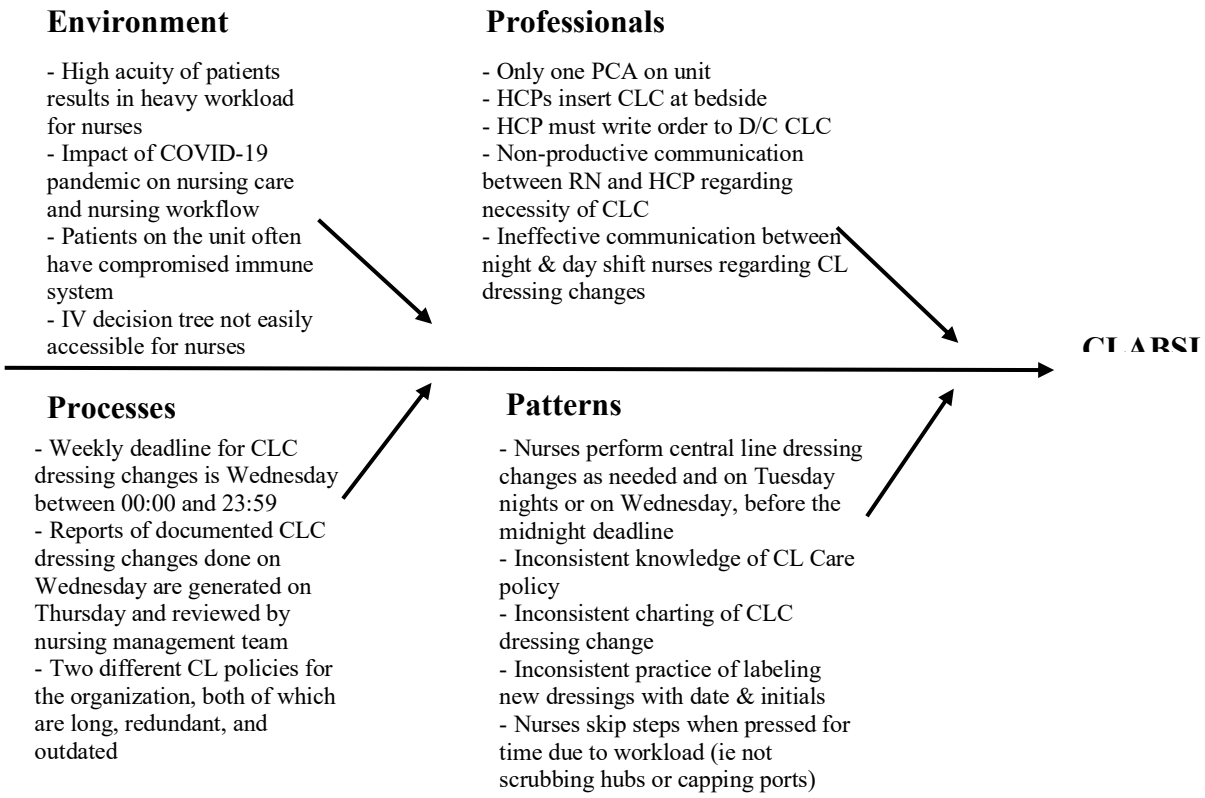




Appendix H
IV Access Decision Tree



Appendix I
Fishbone Diagram to Analyze Factors that Contribute to CLABSI Occurrence in the ICU

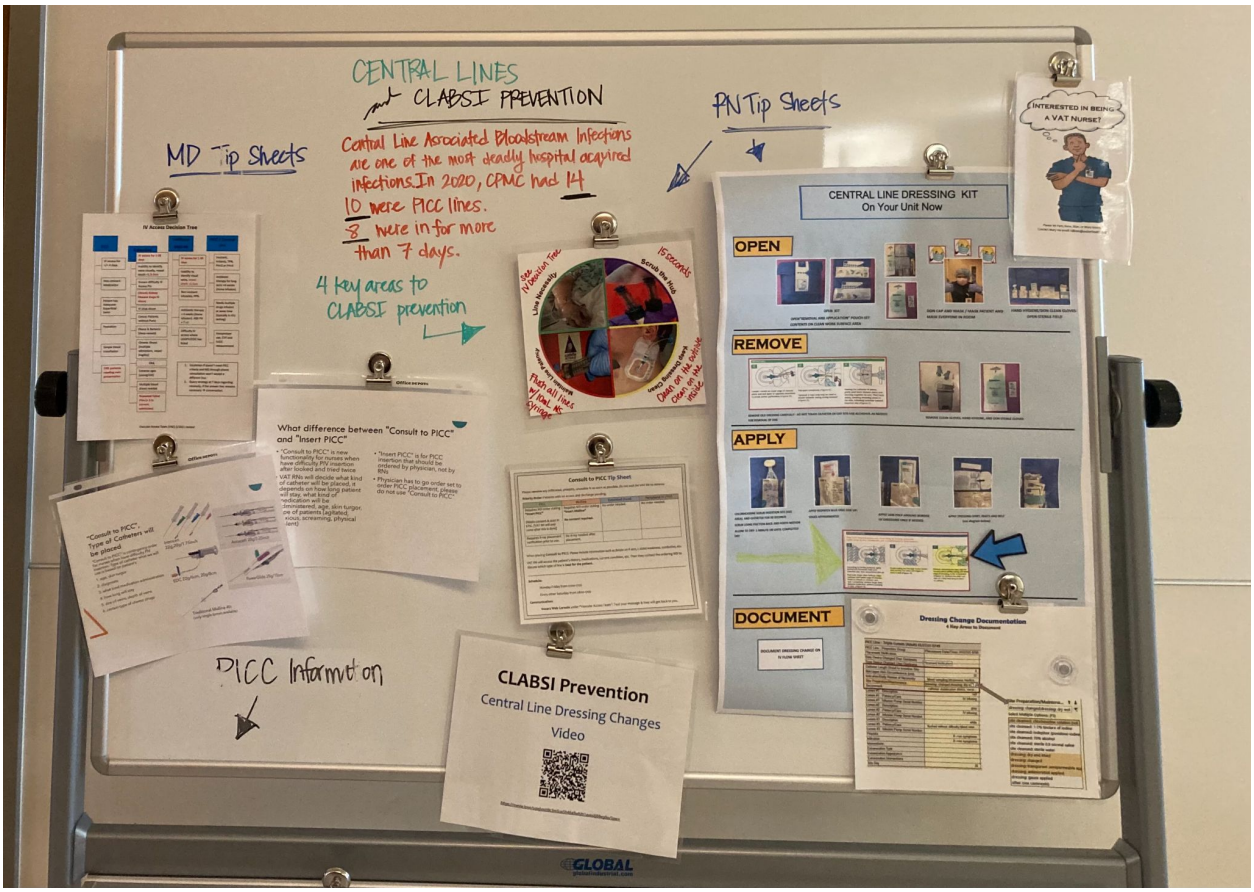


Appendix J
Interventions stratified by Target Area

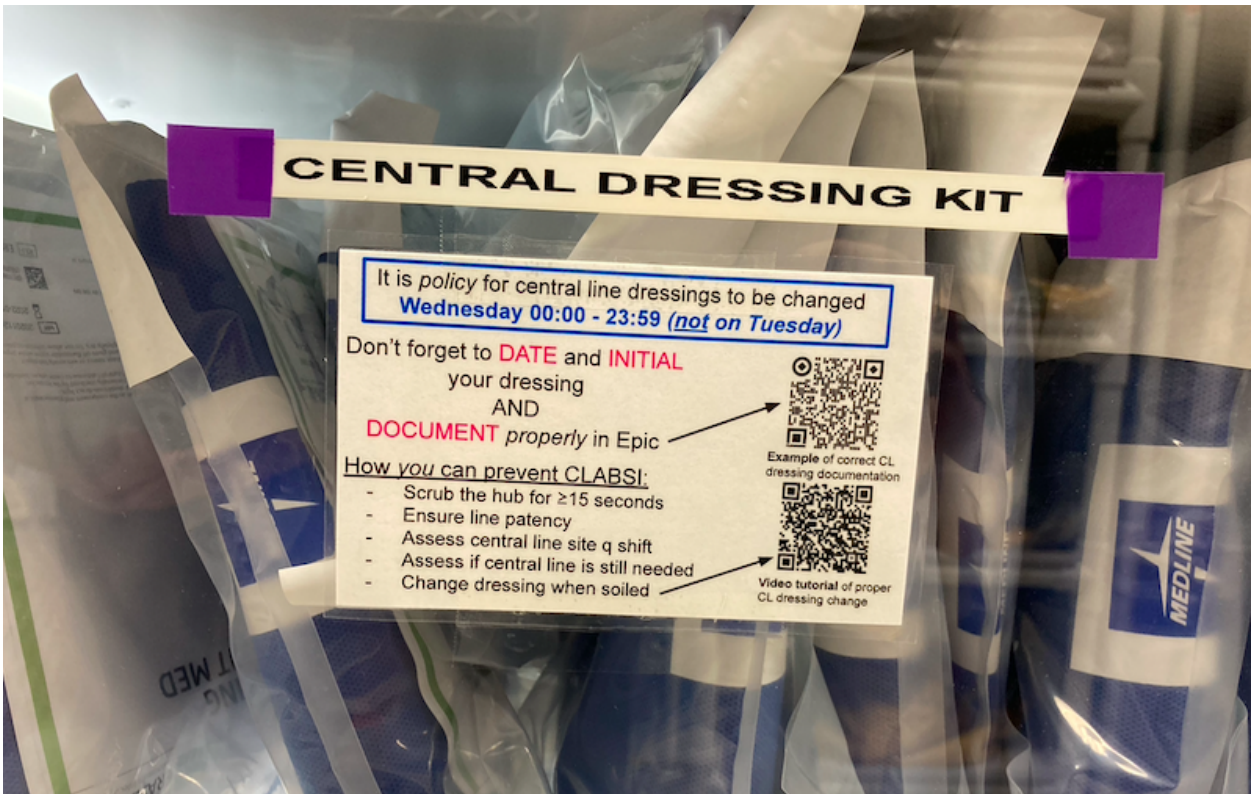
Target Area	Intervention	Week initiated
Processes	Standardization of CL policy	6
	Daily chlorhexidine gluconate (CHG) baths for patients with central lines	9
	Creation of Intense Analysis (IA) form to document retrospective data for any CLABSI event*	6
Awareness	Whiteboard with educational material on CLABSI prevention and proper CL care placed on unit*	6
	Signs posted in the supply room and disseminated each week on the shifts CL dressings should be changed. Content included: ● reminders about proper CL care* ● Video tutorial of CL dressing change* ● Instructions for correct documentation*	7
Surveillance	Peer-auditing forms*	6
	Targeted CL Dressing Audits based on weekly report of CL dressing documentation*	6
	Daily rounding of line necessity for all CLs that have been in place for seven days or more	8

*Interventions primarily under the purview of the students completing this quality improvement project.

Appendix L
CLABSI Prevention Whiteboard



Appendix M
PYXIS Signs



It is *policy* for central line dressings to be changed
Wednesday 00:00 - 23:59 (not on Tuesday)

Don't forget to DATE and INITIAL
your dressing
AND
DOCUMENT *properly* in Epic

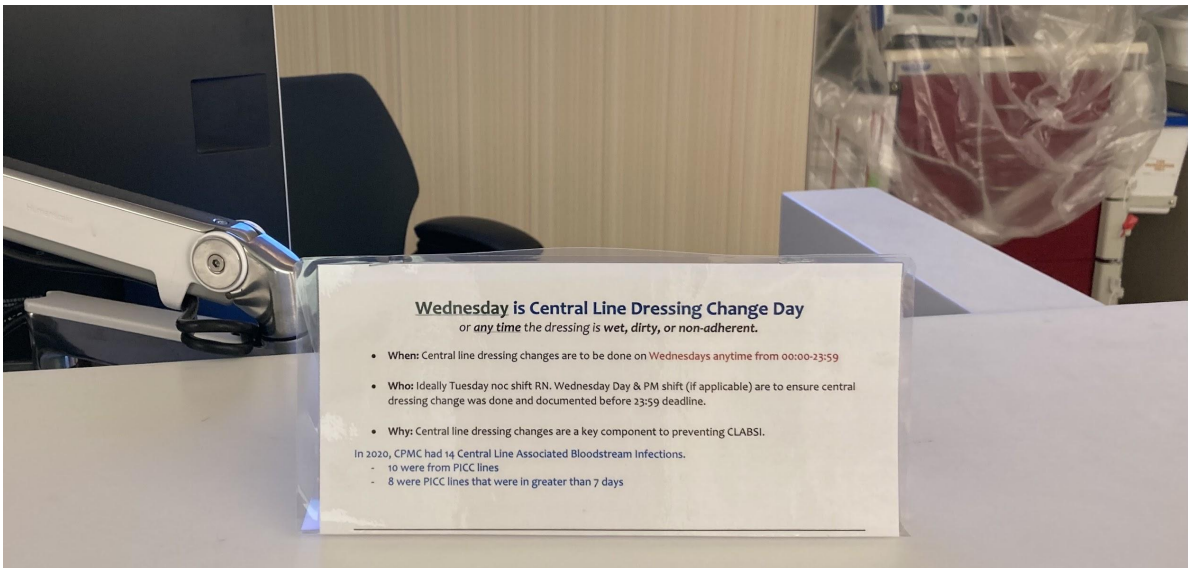
Example of correct CL dressing documentation

How *you* can prevent CLABSI:

- Scrub the hub for ≥15 seconds
- Ensure line patency
- Assess central line site q shift
- Assess if central line is still needed
- Change dressing when soiled

Video tutorial of proper CL dressing change

Appendix N
Stand up signs

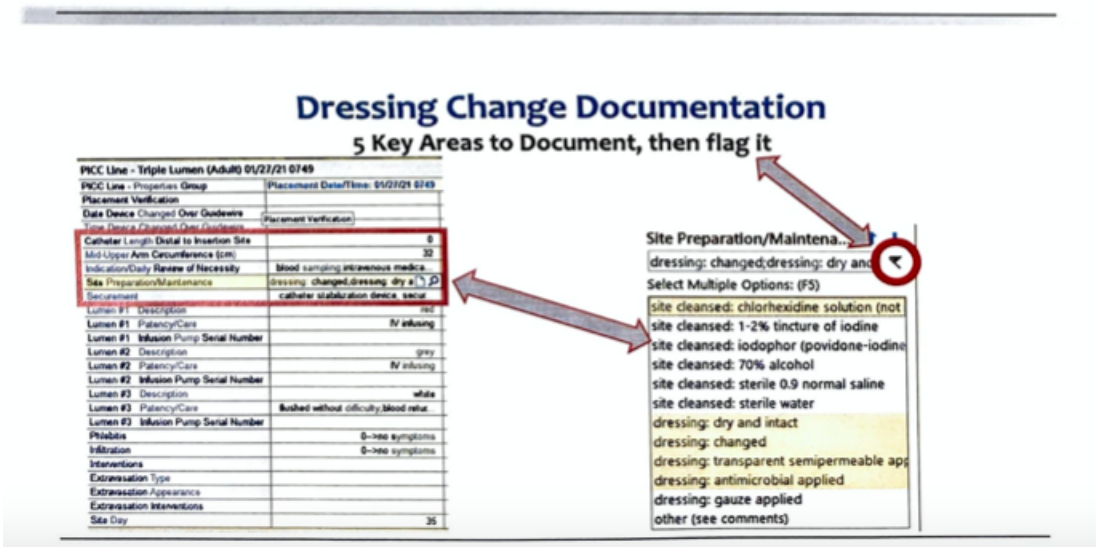


Wednesday is Central Line Dressing Change Day

or **any time** the dressing is **wet, dirty, or non-adherent.**

- **When:** Central line dressing changes are to be done on Wednesdays anytime from 00:00-23:59
- **Who:** Ideally Tuesday noc shift RN. Wednesday Day & PM shift (if applicable) are to ensure central dressing change was done and documented before 23:59 deadline.
- **Why:** Central line dressing changes are a key component to preventing CLABSI.

In 2020, CPMC had 14 Central Line Associated Bloodstream Infections.
- 10 were from PICC lines
- 8 were PICC lines that were in greater than 7 days



Appendix O
Evidence-Based Change of Practice Project Checklist

UNIVERSITY OF SAN FRANCISCO | School of Nursing and Health Professions

EVIDENCE-BASED CHANGE OF PRACTICE PROJECT CHECKLIST *

Instructions: Answer YES or NO to each of the following statements:

Project Title:	**YES**	**NO**
The aim of the project is to improve the process or delivery of care with established/ accepted standards, or to implement evidence-based change. There is no intention of using the data for research purposes.	X	
The specific aim is to improve performance on a specific service or program and **is a part of usual care**. ALL participants will receive standard of care.	X	
The project is **NOT** designed to follow a research design, e.g., hypothesis testing or group comparison, randomization, control groups, prospective comparison groups, cross-sectional, case control). The project does **NOT** follow a protocol that overrides clinical decision-making.	X	
The project involves implementation of established and tested quality standards and/or systematic monitoring, assessment or evaluation of the organization to ensure that existing quality standards are being met. The project does **NOT** develop paradigms or untested methods or new untested standards.	X	
The project involves implementation of care practices and interventions that are consensus-based or evidence-based. The project does **NOT** seek to test an intervention that is beyond current science and experience.	X	
The project is conducted by staff where the project will take place and involves staff who are working at an agency that has an agreement with USF SONHP.	X	
The project has **NO** funding from federal agencies or research-focused organizations and is not receiving funding for implementation research.	X	
The agency or clinical practice unit agrees that this is a project that will be implemented to improve the process or delivery of care, i.e., **not** a personal research project that is dependent upon the voluntary participation of colleagues, students and/ or patients.	X	
If there is an intent to, or possibility of publishing your work, you and supervising faculty and the agency oversight committee are comfortable with the following statement in your methods section: *"This project was undertaken as an Evidence-based change of practice project at X hospital or agency and as such was not formally supervised by the Institutional Review Board."*	X	

ANSWER KEY: If the answer to **ALL** of these items is yes, the project can be considered an Evidence-based activity that does NOT meet the definition of research. **IRB review is not required. Keep a copy of this checklist in your files.** If the answer to ANY of these questions is **NO**, you must submit for IRB approval.

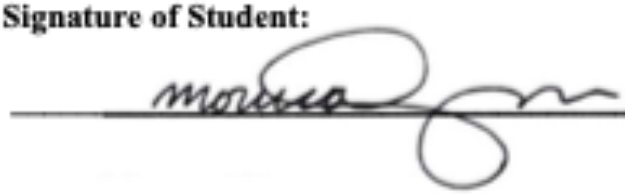
*Adapted with permission of Elizabeth L. Hohmann, MD, Director and Chair, Partners Human Research Committee, Partners Health System, Boston, MA.

UNIVERSITY OF SAN FRANCISCO | School of Nursing and Health Professions

STUDENT NAME (Please print):

Monica Shaw

Signature of Student:



DATE: 2/21/2021

SUPERVISING FACULTY MEMBER NAME (Please print):

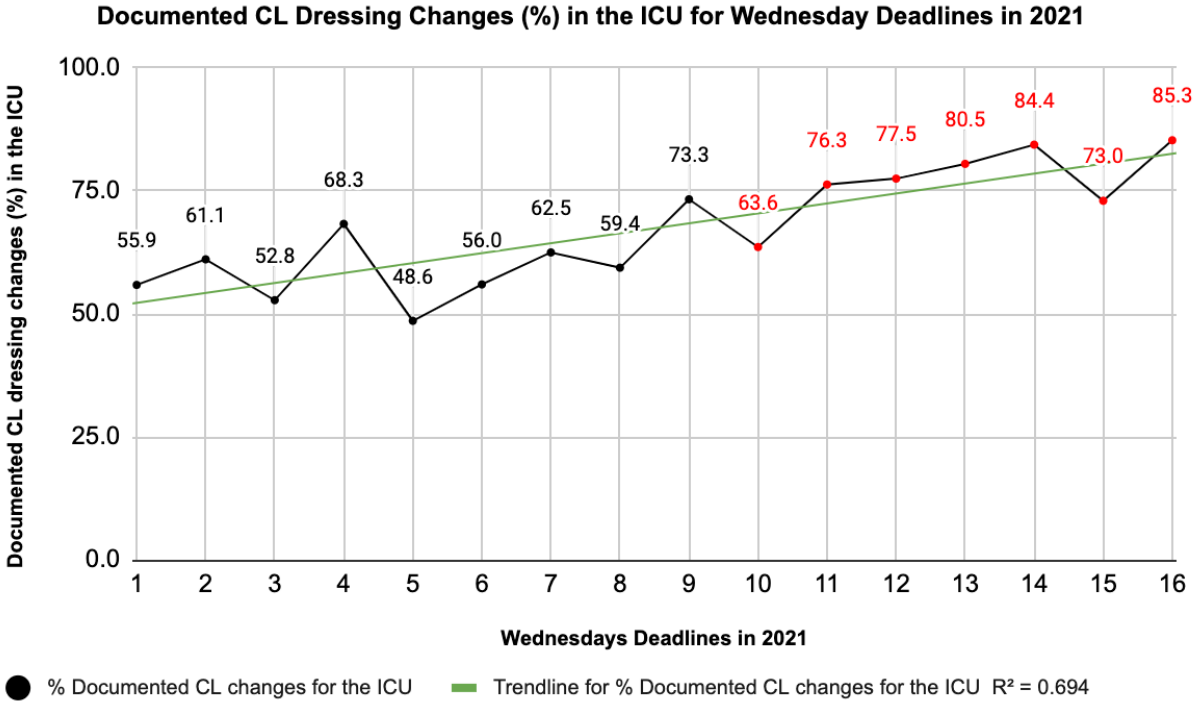
Marcianna Nosek

Signature of Supervising Faculty Member

Dr. Marcianna Nosek

DATE 4-22-21

Appendix P
Percentage of Documented CL Dressing Changes by Wednesday Deadlines in 2021



Pre-intervention average: 58.1% Post-intervention average: 77.2%

Date range: 1/7/2021(1) - 4/14/2021 (15)
CLs inserted on Wednesday excluded from fallout count 3/4/2021(9) - Present
GOAL = 100% compliance for documented CL dressing changes by the Wednesday deadline
Intervention implementation data represented in red
% increase in CL dressing change since roll out of intervention: 32.9%